Proj. Gr. No. :33

Sinhgad College of Engineering

Department of Computer Engineering

Project Approval Form

Year : 2021-22

(To be filled by students)

Review Committee Members:_____ Date: _____

Title of Project: Human Activity Identification

Domain according to ACM-CCS Classification: Machine Learning

No. of IEEE / Equivalent Technical papers referred: 4

Title of Review Paper-1: Human Activity Recognition Using Pose Estimation and Machine Learning Algorithm

Name of publication with Year: IEEE 2021

Seed Idea:

Human Activity Recognition is becoming a popular field of research in the last two decades. Understanding human behavior in images gives useful information for many computer vision problems and has many applications like scene recognition and pose estimation. There are various methods present for activity recognition; every technique has its advantages and disadvantages. Despite being a lot of research work, recognizing activity is still a complex and challenging task. In this work, we proposed an approach for human activity recognition and classification using a person's pose skeleton in images. This work is divided into two parts; a single person poses estimation and activity classification using pose. Pose Estimation consists of the recognition of 18 body key points and joint's locations. We have used the OpenPose library for pose estimation work. And the activity classification task is performed by using multiple logistic regression. We have also shown a comparison between various other regression and classification algorithm's accuracy on our dataset. We have prepared our dataset, divided it into two parts, one is used to train the model, and another is used to validate our proposed model's performance.

Title of Review Paper-2: Efficient Frequency Domain Feature Extraction Model using EPS and LDA for Human Activity Recognition

Name of publication with Year: IEEE 2020

Seed Idea:

Enveloped Power Spectrum (EPS) is used for extracting impulse components of the signal, and the Linear Discriminant Analysis (LDA) is used as a dimensionality reduction procedure to extract the discriminant features for human daily activity recognition. After completing EPS feature extraction techniques, LDA is performed on those extracted spectra for extracting features using the dimension reduction technique. Finally, the discriminant vocabulary vector is trained by the Multiclass Support Vector Machine (MCSVM) to classify human activities.

Title of Review Paper-3: Exploiting temporal information for 3D human pose estimation

Name of publication with Year: IEEE 2018

Seed Idea:

In this work, we address the problem of 3D human pose estimation from a sequence of 2D human poses. Although the recent success of deep networks has led many state-of-the-art methods for 3D pose estimation to train deep networks end-to-end to predict from images directly, the top-performing approaches have shown the effectiveness of dividing the task of 3D pose estimation into two steps: using a state-of-the-art 2D pose estimator to estimate the 2D pose from images and then mapping them into 3D space. They also showed that a low-dimensional representation like 2D locations of a set of joints can be discriminative enough to estimate 3D pose with high accuracy. However, estimation of 3D pose for individual frames leads to temporally incoherent estimates due to independent error in each frame causing jitter. Therefore, in this work we utilize the temporal information across a sequence of 2D joint locations to estimate a sequence of 3D poses. We designed a sequence-to-sequence network composed of layer-normalized LSTM units with shortcut connections connecting the input to the output on the decoder side and imposed temporal smoothness constraint during training. We found that the knowledge of temporal consistency improves the best reported result on Human3.6M dataset by approximately 12.2% and helps our network to recover temporally consistent 3D poses over a sequence of images even when the 2D pose detector fails.

Title of Review Paper-4: A Partially Binarized Hybrid Neural Network System for Low-Power and Resource Constrained Human Activity RecognitionUsing Depth Maps and Postures

Name of publication with Year: IEEE 2018

Seed Idea:

A custom Human Activity Recognition system is presented based on the resource-constrained Hardware (HW) implementation of a new partially binarized Hybrid Neural Network. The system processes data in real-time from a single tri-axial accelerometer and is able to classify between 5 different human activities with an accuracy of 97.5% when the Output Data Rate of the sensor is set to 25 Hz. The new Hybrid Neural Network (HNN) has binary weights (i.e., constrained to +1 or −1) but uses non-binarized activations for some layers. This, in conjunction with a custom pre-processing module, achieves much higher accuracy than Binarized Neural Network. During preprocessing, the measurements are made independent from the spatial orientation of the sensor by exploiting a reference frame transformation. A prototype has been realized in a Xilinx Artix 7 FPGA, and synthesis results have been obtained with TSMC CMOS 65 nm LP HVT and 90 nm standard cells. Best result shows a power consumption of 6.3 µW and an area occupation of 0.2 mm2 when real-time operations are set, enabling in this way, the possibility to integrate the entire HW accelerator in the auxiliary circuitry that normally equips inertial Micro Electro Mechanical Systems (MEMS).

Project Approval Review Committee Report

Review Committee Members:_____Date: _____

Names of modules for proposed system:

Human Activity Detection using Camera or Uploaded video input.

Platforms and Tools planned to use for implementation:
IDE - vs code
Framework - Django
Language – Python
Libraries – open CV, mediapipe,sk-learn,pandas,numpy

Identification of Input Dataset:

We are creating our dataset using 6 action video database which we have created. This file contains 2168 rows and 133 columns.

Any other requirement:

RAM 8GB, Hard disk 40GB, Intel i5 Processor, Windows 10

Suggestions given by Review committee members:

Approved/Approved with modification/Not Approved: _____

Name of Review committee member	Signature
1._____	_____
2._____	_____
3. _____	_____

Abstract

Human activity recognition, or HAR for short, is a broad field of study concerned with identifying the specific movement or action of a person based on sensor data.

Movements are often typical activities performed indoors, such as walking, talking, standing, and sitting. They may also be more focused activities such as those types of activities performed in a kitchen or on a factory floor. It will mainly be used for eldercare and healthcare as an assistive technology when ensemble with other technologies likes Internet of Things (IoT). HAR can be done with the help of sensors, smartphones, or images. Activity recognition is used in many applications such as surveillance, anti-terrorists, and anti-crime securities as well as life logging and assistance.

Human activity recognition plays a significant role in human-to- human interaction and interpersonal relations. The human ability to recognize another person's activities is one of the main subjects of study of the scientific areas of computer vision and machine learning. With the advent of Pose estimation and classification algorithm, which canbe used on images/video input, it is now possible to collect and store data on different aspects of human movement under the conditions of free living.This technology has the potential to be used in automated activity profiling systems which produce a continuous record of activity patterns over extended periods of time. Such activity profiling systemsare dependent on classification algorithms which can effectively interpret motion data and identify different activities. This report reviews the different techniques which have been used to classify normal activities and/or identify falls from body-joints data. The report is structured according to the different analytical techniques and illustrates the variety of approaches which have previously been applied in this field. Although significant progress has been made in this important area, there is still significant scope forfurther work, particularly in the application of advanced classification techniques to problems involving many different activities.

This Project will analyze the activity being performed by the user in the Video/Image input. Human activity recognition will use Pose estimation and classification algorithm to analyze the data set and detect the activity.

System Overview Diagram